# Google

## How Search Ads are Ranked and Priced on Google:
## A Briefing Paper Presented to the Competition & Markets Authority

## INTRODUCTION

This briefing paper provides Google's response to Questions 1-2 of the CMA's Request for Information dated 14 February 2020. It focuses on search advertising on Google through Google Ads. Display advertising is covered in a separate briefing paper.

As part of its focus on search advertising on Google, this paper provides a deep dive into the components of Ad Rank,[1] including the inputs, variables, and features of Google's algorithms, including how and why the Ad Rank algorithms were designed. In particular, this paper focuses on the bidding component of Ad Rank (both manual bidding and automated bidding strategies),[2] as well as the thresholds and reserve-pricing systems of our search ads auctions.[3]

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[1] See About ad position and Ad Rank <https://support.google.com/google-ads/answer/1722122>.

[2] See Determine a bid strategy based on your goals <https://support.google.com/google-ads/answer/2472725>.

[3] See Ad Rank thresholds: Definition <https://support.google.com/google-ads/answer/7634668>; Actual cost-per-click (CPC): Definition <https://support.google.com/google-ads/answer/6297>.

A single paper cannot capture all the technical details of Google's complex software code or the nuances of any particular component or algorithm. However, this paper attempts to provide a conceptual, non-technical understanding of how Ad Rank works, with a greater level of detail than what is available in our Help Center[4] or other published materials.

Relevant technical documentation is listed at **Annex 3**.

## THE GOOGLE SEARCH RESULTS PAGE (SERP)

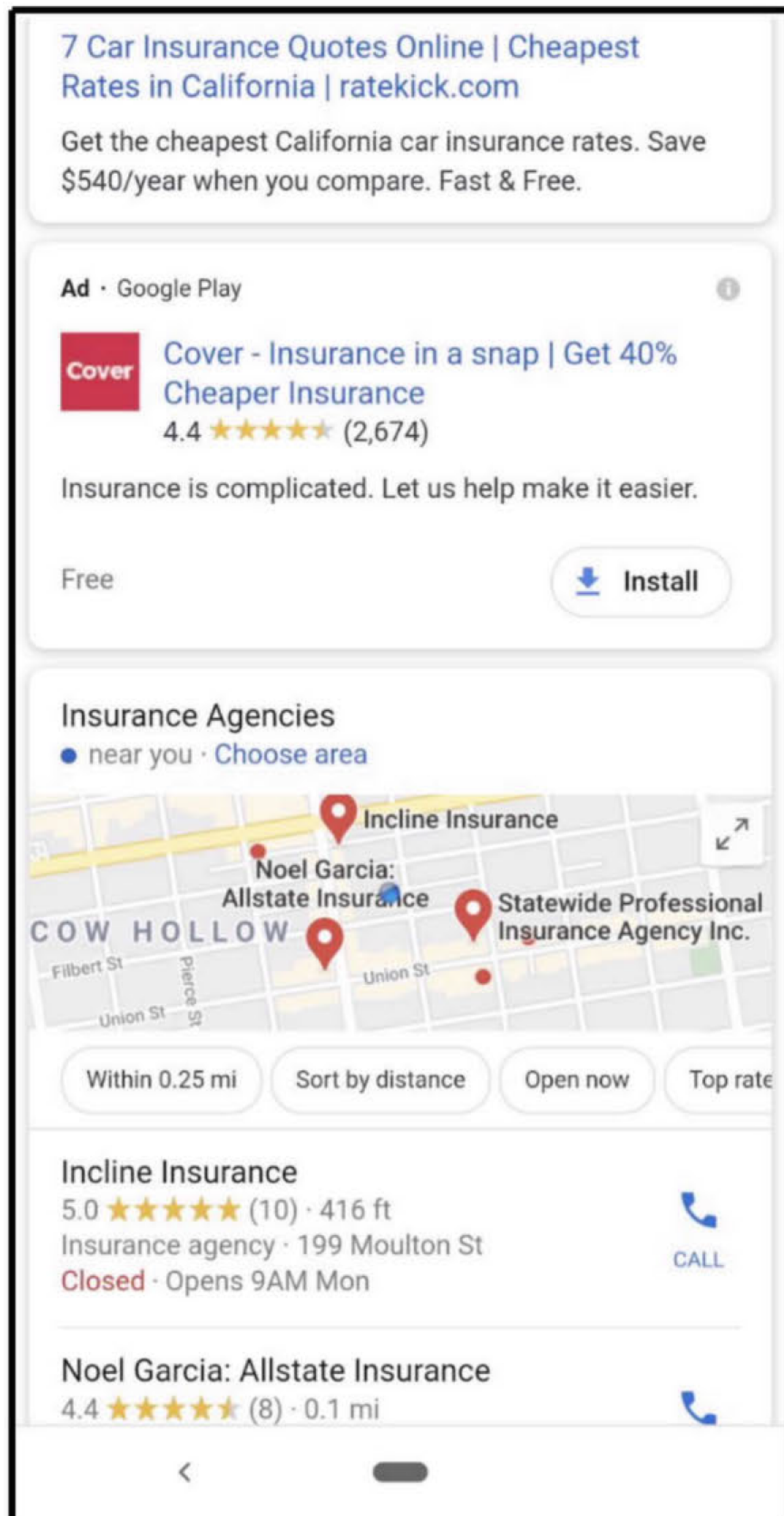Assume a user visits Google on a mobile phone and enters a query for "insurance." Before tapping or swiping, the user may see:



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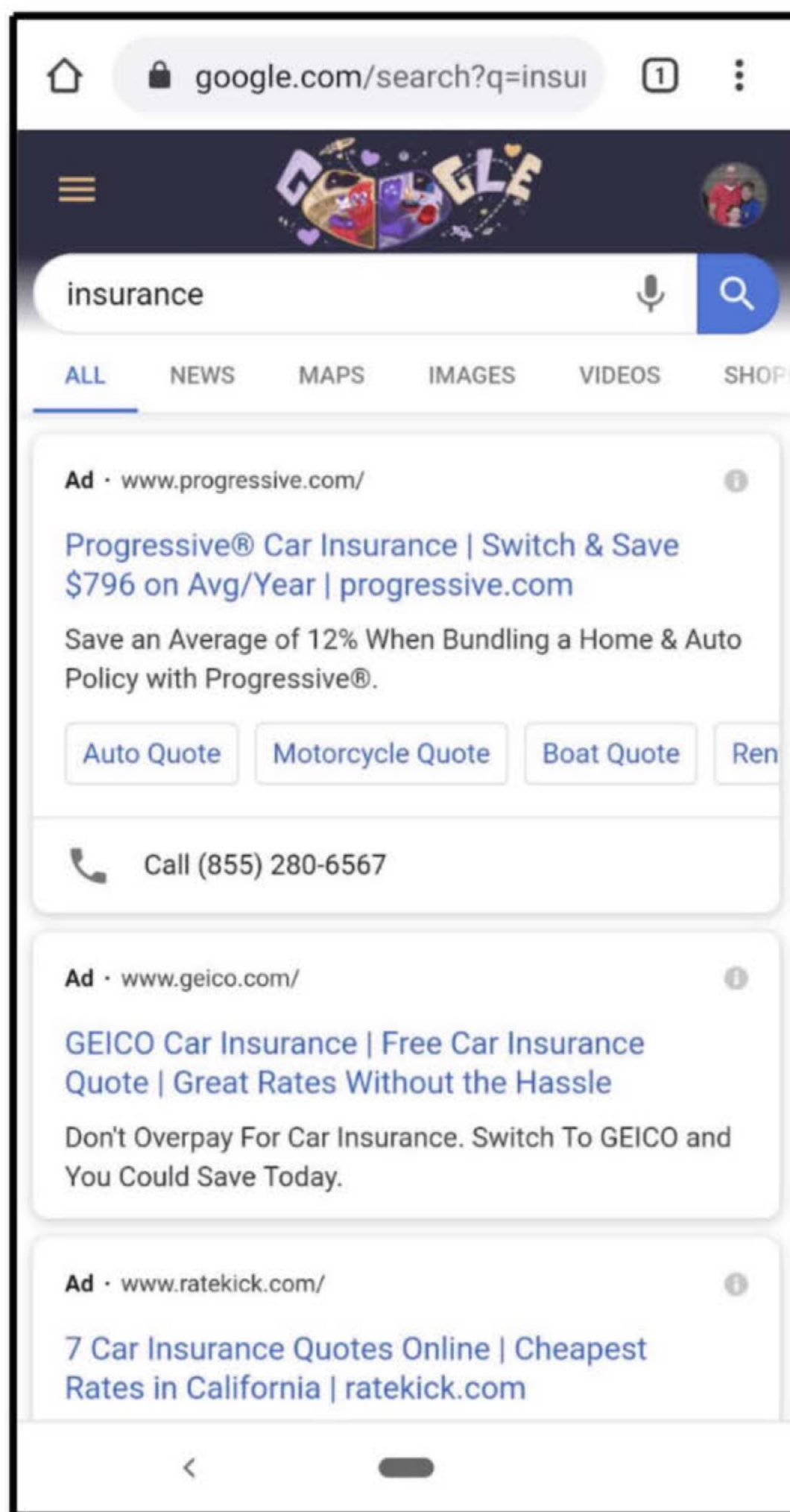
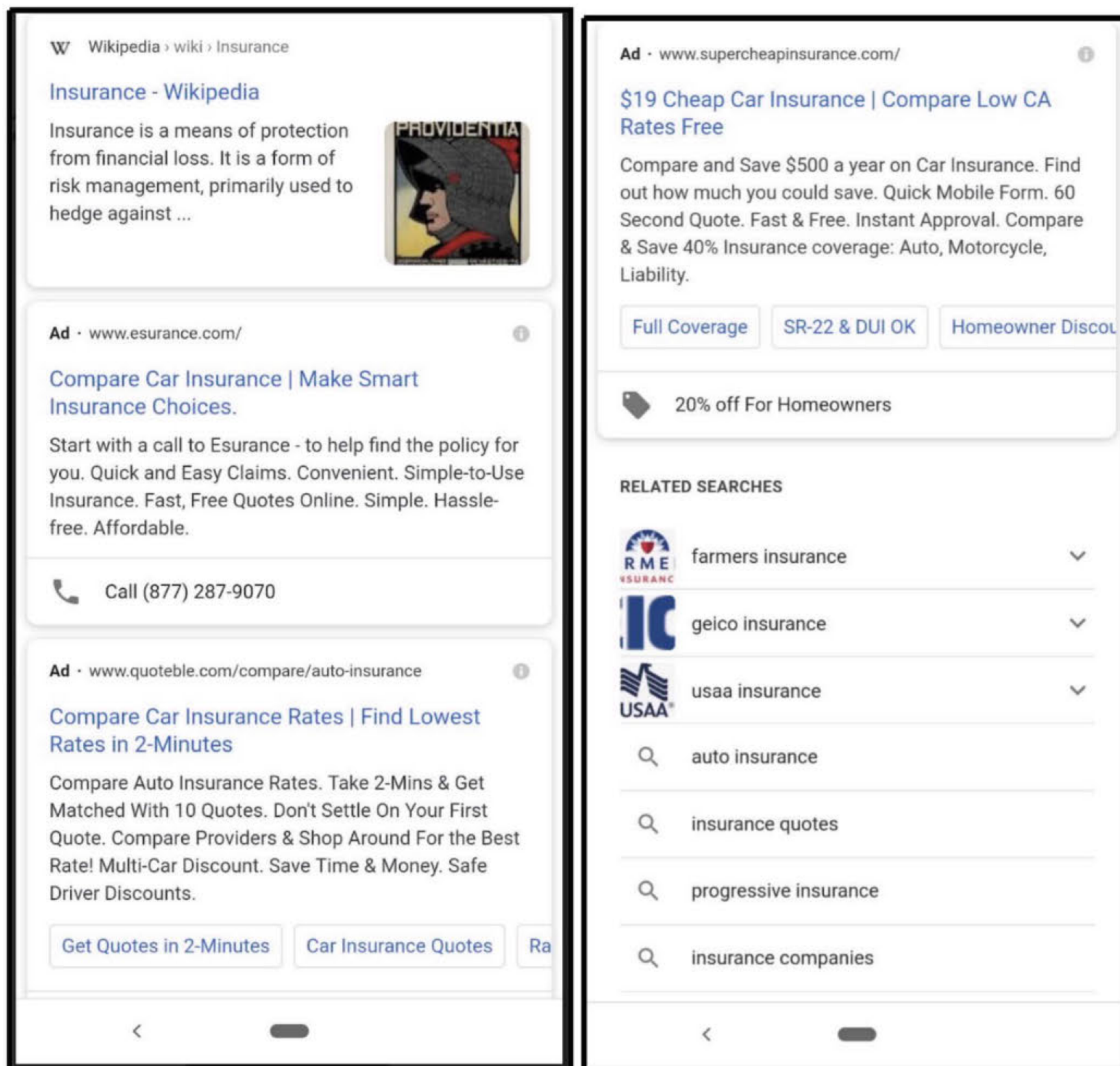[4] See About the Google Ads Help Center <https://support.google.com/google-ads/answer/3094231>.

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The user then begins scrolling down the search results page (SERP) and sees:



And when the user scrolls to the very bottom of the SERP:

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**(bottom of mobile search results page)**

In total, in addition to the maps,[5] local listings, related searches, and other non-paid ("organic") results, the user will have seen a total of seven ads on the SERP in this particular example: four above the organic listings (known as the "top slot") and three below the organic listings (known as the "bottom slot").

This is a highly unusual result: very few queries on Google trigger this many ads, and the vast majority of queries don't show any ads at all.[6] But for purposes of this paper, the "insurance" query is used to illustrate the concept of Ad Rank.

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[5] Note that ads can appear in Google Maps as well, but they are not part of the auction discussed in this briefing paper (and no Maps ads show in the particular example above).

[6] In January 2020, about 20 per cent of global queries on Google resulted in at least one text ad somewhere on the first-page SERP (i.e., either top slot or bottom slot) and less than 2 percent of global queries on Google resulted in four or more ads.

For simplicity, we'll refer to the ads in the top slot as "Top1," "Top2," "Top3," and "Top4"; and we'll refer to the ads in the bottom slot as "Bottom1," "Bottom2," and "Bottom3."

## AD RANK: AN OVERVIEW

It is safe to assume that more than seven advertisers worldwide would have liked their ads to have shown in response to the query for "insurance." Of the seven advertisers whose ads did show, it's also safe to assume that each of them would have liked to have appeared in the first position of the top slot. This paper will explain how Google selects and ranks the ads that appear on its SERP, a concept known as Ad Rank, which works as follows:

at the time of the "insurance" query, Google identifies a few hundred ads in the Google Ads system that are likely to be highly relevant to the user (we weed out, for example, ads that are unrelated to insurance as well as insurance-related ads that are ineligible to show[7]). We then send these ads to a system known as the "Ad Mixer" to assign each of the ads a score, known internally as an "Ad Score" or "Long-term Value ("LTV") Score." Ads with sufficiently high LTV Scores (*e.g.*, those that exceed our quality thresholds) are eligible to appear on the SERP; and assuming all other eligibility conditions are also met, they will be ranked in order of those scores, from highest to lowest.

This process is commonly referred to as the "Ad Auction,"[8] which derives from the role that advertiser "bids" play in the calculation of LTV Scores.[9] An advertiser's bid is also known as the maximum cost-per-click (CPC), or "MaxCPC,"[10] which represents the maximum amount the advertiser is willing to pay Google whenever a user clicks on its ad (In Google Ads, advertisers only pay for search ads when users actually click on them). At its most basic level, the LTV Score of each ad is a function of the advertiser's bid, the quality of the ad itself (*i.e.*, the ad copy or ad "creative"), and the quality of the "landing page" (*i.e.*, the page on the advertiser's website where the user "lands" after clicking on the ad). The higher the combination of bid and quality, the higher the LTV Score (*i.e.*, the higher the Ad Rank).

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[7] Ads can be weeded out for a wide variety of reasons, such as a mismatch between the language of the query (English) and the language of the ad (French); a mismatch between the advertiser's location settings (targeted at Los Angeles) and the user's estimated location (San Francisco); the exhaustion of the advertiser's daily or monthly budget; the expiration of the advertiser's credit card; or a violation of our ads policies.

[8] See The ad auction <https://support.google.com/google-ads/answer/1704431>.

[9] See Choose your bid and budget <https://support.google.com/google-ads/answer/2375454>.

[10] See Maximum CPC bid: Definition <https://support.google.com/google-ads/answer/6326>.

## Computing LTV: an Overview

Google's LTV algorithms seek to predict whether or not the benefits of showing a particular ad will exceed the costs:[11]

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The expected revenue from showing a particular ad — known internally as the expected cost per 1,000 (mille) impressions, or eCPM, of an ad "impression" — is a function of the advertiser's bid (*i.e.*, the most the advertiser is willing to pay Google per click) and the probability that the user will actually click on the ad.[12] This probability is called the "expected click-through rate,"[13] known internally as "predicted click-through rate," or pCTR:

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The predicted benefits to Google of an ad impression are then offset by the predicted costs to Google of showing the ad, which include (i) an "impression cost," the cost of showing a low-quality ad (*i.e.*, the probability that the text of the ad copy itself, or ad "creative," is low quality, multiplied by a weight), and (ii) a "click cost," the cost that the user will have a low-quality experience on the advertiser's landing page after clicking on the ad, multiplied by a weight. Our prediction of the quality of the ad itself being good is known internally as "Predicted Creative Quality," or "pCQ," and our prediction of the quality of the landing page experience being good is known internally as "pLQ."

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[11] The modern version of LTV launched in 2011. See "Ads quality improvements rolling out globally" <https://adwords.googleblog.com/2011/10/ads-quality-improvements-rolling-out.html>.

[12] Note that "expected revenue" does not mean advertisers are actually charged what they bid. As discussed below in the section entitled "Actual CPC: What Advertisers Actually Pay Per Click," the "Actual CPC" is often less than the "Max CPC" bid. See also Actual cost-per-click (CPC): Definition <https://support.google.com/google-ads/answer/6297>.

[13] See Expected clickthrough rate: Definition <https://support.google.com/google-ads/answer/1659696>.

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(The weights attached to the pCQ and pLQ functions are discussed next.)

A key element of the LTV algorithm is the inverse relationship between the advertiser's bid and the increased quality needed to yield a similar ranking if the bid were lowered. This inverse relationship has been central to Ad Rank since the early days of AdWords. Ads with low quality metrics (*i.e.*, low pCTR, pCQ, and/or pLQ) would need higher bids to successfully compete against ads with higher quality metrics. And *vice versa*, high-quality ads can have lower bids and still compete successfully in auctions. This inverse dynamic helps incentivize advertisers to improve the quality of their ads.

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Only ads with a positive LTV (LTV > 0) are eligible to show on SERP.[16] For example, if the advertiser's bid (a/k/a "maxCPC")                    Redacted
then expected revenue (eCPM) will be positive, and therefore the ad will be eligible to show if the expected costs            Redacted                          are less than eCPM. Conversely, if the advertiser's bid        Redacted            , then LTV will be negative (because eCPM will be negative), and therefore the ad will have failed to clear its threshold (LTV > 0) and will be ineligible to show.

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[14] The functions on the cost side of the equation can also be thought of as the probability of a good click (pCQ) and the probability of a bad click (1-pCQ) — and the probability of a good landing page experience (pLQ) and the probability of a bad one (1-pLQ) — each with multiplicative and/or additive weights, as discussed further below. This formulation highlights how, as the probability of good clicks and good landing page experiences goes up, the impression and click costs go down.

[15] LTV is a critically important underpinning of Ad Rank because it helps ensure that Google doesn't earn quick short-term gains at the expense of longer-term profitability. For example, if Google were to show irrelevant or otherwise low-quality ads, users may click on them in the short-term (driving short-term gains to Google), but in the longer term, users may become "blind" to these low-quality ads (that is, users learn to skip over ads that they believe are less relevant). Ads blindness harms the long-term profitability of ad-funded platforms because it makes clicks less valuable to advertisers and trains them to lower the prices they are willing to pay for inventory. See "*Focus on the Long-Term: It's better for Users and Business*" <https://research.google/pubs/pub43887/>.

[16] As noted above, eligibility for an ad to show (*i.e.*, LTV>0) doesn't necessarily mean the ad will actually show. Other eligibility conditions must also be met for ads to appear. For example, it's possible that an LTV-positive ad doesn't show because the SERP has already reached its maximum ad load with higher-scoring ads.

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Each of these variables (bid, pCTR, pCQ, and pLQ) and the constant values (A, minCPC, B, C, D, and E) will be discussed in turn below.

## Bidding: Manual vs. Automated

The bid component of the LTV Score is determined based on each advertiser's decision to use either a "manual" or "automated" bidding strategy for a particular ad campaign.[17] With manual CPC bidding,[18] advertisers can set max CPC bids for each keyword. For example, a florist may wish to set higher max CPC bids for roses-related keywords than for lilies-related keywords. With automated bidding,[19] also known as "Smart Bidding" or "auction-time bidding," advertisers provide Google with a performance goal (*e.g.*, maximize clicks, maximize "conversions"[20]), and then allow Google's machine learning algorithms to dynamically set CPC bids — tailored to the specific context of each query and auction — to meet the advertiser's stated performance goals. Google's machine-learning algorithms set bids at query time, before the auction is run. Once the bids have been set, the ads using automated bidding are treated like ads using manual bidding, and enter the auction in the same way.

The following are examples of Google's automated bidding tools:

- **"Target Cost-per-Action," also known as "Target Cost-per-Acquisition," or "Target CPA."** The advertiser provides Google with a target cost per acquisition (*e.g.*, target an average cost of $1 for every user who signs up for a newsletter), and then Google automatically sets CPC bids to help the advertiser obtain as many conversions as possible (*e.g.*, as many newsletter sign-ups as possible) at or close to the target CPA.[21]

- **"Target Return on Ad Spend," or "Target ROAS."** Google automatically sets bids to help the advertiser obtain as much conversion value as possible at or close to the target ROAS set by the advertiser.[22]

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[17] See Determine a bid strategy based on your goals
<https://support.google.com/google-ads/answer/2472725>.

[18] See About Manual CPC bidding <https://support.google.com/google-ads/answer/2464960>.

[19] See About automated bidding <https://support.google.com/google-ads/answer/2979071>.

[20] See Conversion: Definition <https://support.google.com/google-ads/answer/6365>.

[21] See About Target CPA bidding <https://support.google.com/google-ads/answer/6268632>.

[22] See About Target ROAS bidding <https://support.google.com/google-ads/answer/6268637>.

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- **"Maximize Clicks."** Google automatically sets bids to help the advertiser obtain as many clicks as possible within the advertiser's set budget.[23]

- **"Maximize Conversions."** Google automatically sets bids to help the advertiser obtain the most conversions as possible within the advertiser's set budget.[24]

- **"Maximize Conversion Value."** Google automatically sets bids to help the advertiser obtain the most conversion value within the advertiser's set budget.[25]

- **"Enhanced Cost-per-Click" or "Enhanced CPC."** This is a blend of both manual and automated bidding strategies, allowing the system to dynamically adjust an advertiser's manual bids to increase their conversion volume while using the manual bids as guidance for the behavior desired by the advertiser.[26]

- **"Target impression share."** Google automatically sets bids to reach, at the lowest cost possible, the impression share specified by the advertiser (*i.e.*, the fraction of targeted queries by each keyword for which their ads could show). The advertiser can specify if the impression share they want is to be measured counting (a) any impressions, (b) only impressions in the top slot, or (c) just top-slot-top-position impressions.[27]

Google's automated bidding algorithms take into account a number of auction-time signals to best meet the advertiser's stated goals in the context of a particular user query. These auction-time signals include, for example:

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[23] See About Maximize clicks bidding <https://support.google.com/google-ads/answer/6268626>.

[24] See About Maximize conversions bidding <https://support.google.com/google-ads/answer/7381968>.

[25] See About Maximize conversion value bidding <https://support.google.com/google-ads/answer/7684216>.

[26] See About Enhanced CPC (ECPC) <https://support.google.com/google-ads/answer/2464964>.

[27] See About Target impression share bidding <https://support.google.com/google-ads/answer/9121108>.

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Many advertisers use a combination of manual and automated bidding strategies, leveraging the deep analyses provided by the Google Ads reporting tools to maximize performance and advertiser goals.[28]

## Predicted Click-through Rate (pCTR)

The most important quality metric within Ad Rank, and a bedrock signal since the early days of AdWords, is expected clickthrough rate,[29] known internally as predicted clickthrough rate, or pCTR. Users vote with their clicks, and the more users click on a particular ad in response to particular queries, the more we learn the high-quality nature of the ad. The models and math underlying our click predictions are complex, using a wide range of variables and machine learning systems, but at a high level the objective is simple: given a particular user's query and an advertiser's particular ad, what is the likelihood that the user will actually click on the ad if we show it, taking into account when, where, and how the user is searching on Google?

The auction-time inputs into our pCTR regression models include, for example:

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As discussed in more detail in the "Formats and Extensions" section immediately below, our pCTR systems also account for other factors that affect the likelihood that a user will click on a particular ad. For example, users are typically more likely to click on ads in a higher ad position than in a lower one (e.g., Top1 vs. Bottom3). Because these factors don't contribute to the underlying quality of a particular ad, our systems "normalize" the click-through metrics before

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[28] See, for example, Evaluate your Smart Bidding performance with bid strategy reports <https://support.google.com/google-ads/answer/7074566>.

[29] See Expected clickthrough rate: Definition <https://support.google.com/google-ads/answer/1659696>.

[30] Note that our pCTR models don't include landing page features because the user hasn't clicked on the ad yet, i.e., the models are trying to predict whether or not the user will click on the ad before knowing precisely what the landing page experience will be like.

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being entered into our LTV algorithms for eligibility determination (*i.e.,* Redacted That way, advertisers aren't unduly penalized by (or unduly credited with) aspects of their historical clickthrough performance that are out of their control.

## Formats and Extensions

Since 2013,[31] the expected impact from formats and extensions has been an important part of Ad Rank.[32] Some examples of formats and extensions include call extensions, sitelinks, and seller ratings.[33]

Ad · www.progressive.com/

Progressive® Car Insurance | Switch & Save $796 on Avg/Year | progressive.com

Save an Average of 12% When Bundling a Home & Auto Policy with Progressive®.

Auto Quote | Motorcycle Quote | Boat Quote | Ren

Call (855) 280-6567

**Call Extension**

**Sitelinks**

Ad · Google Play

Cover Cover - Insurance in a snap | Get 40% Cheaper Insurance
4.4 ★★★★☆ (2,674)

Insurance is complicated. Let us help make it easier.

Free          Install

**Seller Ratings**

# Redacted

Here's an example from the Progressive ad (with a call extension and sitelinks), which appeared in the first position of the top slot in our original sample query above:

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[31] See Improving Ad Rank to show more relevant ad extensions and formats <https://adwords.googleblog.com/2013/10/improving-ad-rank.html>.

[32] See About extensions <https://support.google.com/google-ads/answer/2375499>.

[33] For a complete list of available formats and extensions, see Select extensions to use <https://support.google.com/google-ads/answer/7332837> and About automated extensions <https://support.google.com/google-ads/answer/7175034>.

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**Predicted Creative Quality (pCQ)**

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[34] A common misperception is that the 1-10 Quality Score shown in an advertiser's account is used to compute Ad Rank. The key LTV quality metrics — pCTR, pCQ, and pLQ — are auction-time metrics, which the 1-10 Quality Score is not. See Settling the (Quality) Score: Using Quality Score to Guide Optimizations <http://services.google.com/fh/files/misc/settling-the-quality-score-whitepaper-final.pdf>.

[35] See Ad relevance <https://support.google.com/google-ads/answer/1659752>.

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**Predicted Landing Page Experience (pLQ)**

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**Thresholds and Reserve Prices**

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[36] See Understanding landing page experience
<https://support.google.com/google-ads/answer/2404197>.

[37] In response to Question 3 of the CMA's RFI of 14 February 2020, Google notes that data collected from Google-owned tracking and analytics services are not an input into the Google search ads auction process. To the extent that advertisers use data from these services to improve the quality of their websites, these services may have an indirect impact on pLQ.

[38] For this example, keep in mind the inverse relationship between bid and quality: when a particular ad isn't showing on SERP, the advertiser must either increase its bid or increase the ad's quality (or both) to help move the base LTV Score from negative to positive. In this way, thresholds can be thought of in two ways: (1) for a given level of ad quality, how high does the advertiser need to bid to yield a positive LTV

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Returning to the LTV equation from above:

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Only ads with a positive LTV Redacted are eligible to show on the SERP. For example, if the advertiser's bid is Redacted then eCPM will be positive, and therefore the ad will be eligible to show Redacted Redacted But if the bid Redacted then the ad will be ineligible to show (because eCPM will be negative and therefore LTV will be negative). In this way, the threshold Redacted establishes a reserve price for an ad. If an advertiser's bid is too low to ensure a positive LTV score, the ad won't show. And if the advertiser is the only advertiser eligible to show (because none of its competitors bid high enough to achieve positive LTV scores), then the smallest bid possible that would still result in a positive LTV score is the reserve price the advertiser will pay for the click.

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Score; and (2) conversely, for a given bid, how high does the ad's quality need to be for a positive LTV.

[39] See Ad Rank thresholds: Definition <https://support.google.com/google-ads/answer/7634668>.

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## Actual CPC: What Advertisers Actually Pay per Click

Advertisers only pay Google for search ads when users actually click on them, a concept known as CPC. The amount that an advertiser pays when receiving a click, or "Actual CPC,"[42] is often less than the advertiser's bid (Max CPC) because with the Google Ads auction, each advertiser only pays what's minimally required to clear the Ad Rank thresholds and beat the LTV Score of the next-best competing advertiser in the auction. And if there are no next-best competitors in the auction (for example, if no competitors have cleared their Ad Rank thresholds), then the Actual CPC is the reserve price.[43]

Returning to the original "insurance" query from above, we now look at a hypothetical list of the top 10 advertisers competing for the query, and we start with the auction for the first position of the top slot:

### Auction No. 1: Top Slot, First Position ("Top1")[44]

| Advertiser | Bid | Quality | Formats | Base LTV Score |
|---|---|---|---|---|
| Advertiser A | high | high | high | 42 |
| Advertiser B | medium | high | high | 28 |
| Advertiser C | medium | high | medium | 16 |
| Advertiser D | medium | high | medium | 4 |
| Advertiser E | medium | medium | low | -18 |
| Advertiser F | medium | medium | low | -22 |
| Advertiser G | medium | medium | low | -30 |
| Advertiser H | medium | low | low | -40 |

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[42] See Actual cost-per-click (CPC): Definition <https://support.google.com/google-ads/answer/6297>.

[43] In February 2020, about ___[Redacted]___ percent of ad clicks (revenue-weighted) were reserve-priced rather than second-priced by the next-best competitor in the auction. And about ___[Redacted]___ percent of all ad clicks were clicks on "singleton" ads (i.e., when only one ad appears on the SERP). Overall, about ___[Redacted]___ percent of global search ads revenue comes from clicks on singleton ads.

[44] This chart is completely hypothetical and its contents bear no relation to actual advertisers or their actual base LTV Scores.

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| Advertiser I | medium | low | low | -52 |
| Advertiser J | low | low | low | -60 |

In this hypothetical first-position auction, four advertisers (Advertisers A, B, C, and D) have cleared the top slot threshold. Advertiser A is "second-priced" against Advertiser B, which means Advertiser A will pay just enough (*e.g.*, rounded up to the nearest billable unit, which in the U.S. is $0.01) to beat Advertiser B's LTV Score. For example, suppose Advertiser A submitted a bid of $1, which yielded an LTV Score of 42. To beat Advertiser B's LTV Score of 28, Advertiser A could have bid as low as, say, $0.84, and still have beaten Advertiser B. So that's what Advertiser A will pay per click, $0.84.

The same basic approach is taken for each position down the page. Take, for example, the auction for the fourth position in the top slot (which excludes Advertisers A, B, and C, who won the auctions for the higher three positions):

### Auction No. 4: Top Slot, Fourth Position ("Top4")

| Advertiser | Bid | Quality | Formats | Base LTV Score |
|---|---|---|---|---|
| Advertiser D | medium | high | medium | 4 |
| Advertiser E | medium | medium | low | -18 |
| Advertiser F | medium | medium | low | -22 |
| Advertiser G | medium | medium | low | -30 |
| Advertiser H | medium | low | low | -40 |
| Advertiser I | medium | low | low | -52 |
| Advertiser J | low | low | low | -60 |

In this auction, Advertiser D is the only advertiser to have cleared the top-slot threshold. As a result, Advertiser D would pay the reserve price for clicks in the fourth position. Specifically, even though Advertiser E may appear in the bottom slot on the same search results page, Advertiser D is reserve-priced, not second-priced by Advertiser E.[45] For example, suppose Advertiser D submitted a bid of $0.60, which yielded an LTV Score of 4. To beat the reserve (*i.e.*, to exceed the base LTV of 0), Advertiser D could have bid as low as, say, $0.52, and still have cleared the threshold. So that's what Advertiser D will pay per click, $0.52.

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[45] If, by contrast, Advertiser E had cleared the top-slot threshold, Advertiser D would have been second-priced by Advertiser E, not reserve priced.

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Next we look at the seventh auction on the page:

### Auction No. 7: Bottom Slot, Third Position ("Bottom3")

| Advertiser | Bid | Quality | Formats | Base LTV Score |
|---|---|---|---|---|
| Advertiser G | medium | medium | low | 17 |
| Advertiser H | medium | low | low | -9 |
| Advertiser I | medium | low | low | -22 |
| Advertiser J | low | low | low | -31 |

Because thresholds vary by slot, the base LTV Scores for the bottom-slot auctions will be different than the LTV Scores for the top-slot auction (*e.g.*, Advertiser G's base LTV scores in the top-slot auctions were -30, but its base LTV scores in the bottom-slot auctions are 17). And because Advertiser G is the only remaining advertiser in this example who cleared the bottom-slot threshold, Advertiser G will be reserve-priced (not second-priced by Advertiser H), and no ads will show in the eighth and final ad position ("Bottom4").

### Randomized General Second-Price Auction (rGSP)

Since the early days of AdWords, the actual price advertisers pay per click (Actual CPC) has been determined by a customized version of a second-price auction, also known as a Vickrey auction. In common parlance, winners of a Vickrey auction don't pay what they bid (as they would in a first-price auction), but instead pay the bid of the next-highest competitor.[46] As described in the Actual CPC section immediately above, we described our version of the second-price auction as requiring advertisers to pay only what's minimally required to clear the Ad Rank thresholds and beat the Ad Rank of their next-best competitor.[47] Using the simplified example above, we illustrated how the Top1 advertiser (Advertiser A) paid $0.84 (in comparison to its $1 bid) because that's the amount that was minimally necessary to clear the thresholds and beat its nearest competitor.

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[46] See Vickrey auction <https://en.wikipedia.org/wiki/Vickrey_auction>.

[47] See Actual cost-per-click (CPC): Definition <https://support.google.com/google-ads/answer/6297>.

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## SIGNIFICANT CHANGES TO AD RANK, PAST AND FUTURE

Since January 2019, one significant improvement to Ad Rank has been to allow thresholds to be dynamically set for each auction based on the thresholds of closely-related auctions. This allows our systems to optimize an advertiser's ability to show its ads in related auctions for similar queries.[48] For example, our systems might dynamically lower thresholds in an auction for "online insurance" to allow an advertiser to compete in that auction (because, for example, its LTV might not otherwise have been high enough), but only if we're able to dynamically increase the thresholds in a related auction for "insurance" in which the advertiser can still afford to participate even at the higher threshold.

Another significant change to Ad Rank since January 2019 has been the global launch of the randomized general second-price auction (rGSP),[49] described above.

In the next few years, we anticipate applying the latest machine learning techniques to better inform auction costs; implement more fine-grained optimizations for innovations like rGSP;

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[48] See Ad Rank thresholds: Definition <https://support.google.com/google-ads/answer/7634668>.

[49] See Actual cost-per-click (CPC): Definition <https://support.google.com/google-ads/answer/6297>.

improve our understanding of user impact (*e.g.*, with respect to ads blindness) and learn how those insights could better inform auction dynamics; and improve ads allocation decisions to better account for the advertiser value (*e.g.*, conversions) they can provide.

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